

ARTICLE IV.—*Notes on North American Diptera, with Descriptions of New Species in the Collection of the Illinois State Laboratory of Natural History.* BY J. R. MALLOCH.

In the course of my work of identifying and arranging the *Diptera* in the collection of the State Laboratory of Natural History I have found several which belong to apparently undescribed species. I have in many cases given to these forms manuscript names, and as certain of the species may figure in the publications of the Laboratory, or in those of the State Entomologist, it is deemed advisable to publish descriptions of these species so as to validate the names under which they stand in the collection.

The types of the new species herein described are all in the collection of the Illinois State Laboratory of Natural History.

During the progress of work in connection with the Biological Survey of the Illinois River many species of *Diptera* have been taken either as larvæ, pupæ, or imagines, and several of these species belonging to the family *Chironomidæ* are dealt with in this paper. The largest species of the genus *Chironomus* known from this country is represented by a great amount of material including all stages, and as no other chironomid has been recorded as having so large a larva as this form, and particularly because the species has not been described in this stage, this opportunity is taken to describe it. That these larvæ form a very considerable proportion of the food of river fishes is well known, and the presence of such species as *Chironomus ferrugineovittatus* Zetterstedt, here referred to, no doubt enhances the status of the river as a fish-producing stream.

CHIRONOMIDÆ

CHIRONOMUS COMPES Coquillett

Chironomus compes Coquillett, Proc. Ent. Soc. Wash., Vol. IX, 1908, p. 145.

Female.—Face and frons brownish yellow; antennæ yellow, becoming brown towards apex; palpi brown. Mesonotum pale yellowish brown; viewed from behind the usual three vittæ are dark reddish brown, the spaces between them, and also posterior to the short central vitta, are distinctly white pollinose; scutellum yellowish; pleuræ pale brown, the surfaces with white pollinosity. Abdomen brown, the posterior margin of all the segments with a broad white pollinose fascia. Legs whitish yellow, fore femora brown, with a pale band just before apices; all tibiæ with the bases broadly and the

apices very narrowly brown, the apices of all the tarsal joints distinctly browned, the dark color on all parts of the legs very sharply defined, giving the legs a ringed appearance, except on the last three tarsal joints (Pl. XIII, Fig. 7). Wings hyaline, veins distinct, brownish. Halteres yellow. Hairs on body yellowish.

Antennal hairs long; basal joint of palpi shorter than second, joints 2-4 subequal. Mesonotum with the hairs rather soft, most distinct and numerous on the spaces between the vittæ; scutellar hairs long and numerous; pleuræ bare. Abdomen with long hairs on both the dorsal and ventral segments. Length of fore tibia 1.25 mm., fore metatarsus 1.75 mm., second joint of tarsus 1 mm., joints 3 and 4 subequal; fore legs with only extremely short hairs, the other pairs with inconspicuous hairs, the length of which does not exceed the tibial diameter. Fork of cubitus slightly beyond the vertical line of the cross vein; wing fringe short; cross vein slightly darkened.

Length, 5-6 mm.

Described by Coquillett from Plummers Island, Md., in the Potomac River.

Illinois localities: Quiver Lake, Illinois River, May 8, 1896 (C. A. Hart), and Urbana, Ill., May 25, 1898, in house (C. A. Hart).

This species is allied to *flavicingulata* Walker, but in the latter there is generally a more or less distinct brown band on the middle of the hind tibia; the proportions of the fore tibia and tarsus are,—tibia 1.55 mm., metatarsus 1.56 mm., second joint 1 mm.; the mid and hind legs of the females of *flavicingulata* are much more hairy, the fork of the cubitus is generally proximad of the cross vein, and the halteres are brown. The average length of the specimens of *flavicingulata* before me is 6.5 mm.

This species was very briefly described, and the foregoing definition is given to facilitate its identification.

Probably a synonym of *devinctus* Say.

CHIRONOMUS FERRUGINEOVITTATUS Zetterstedt

This species, or at least one which agrees in every particular with the description thereof, is abundant in various places along the Illinois River in the vicinity of Havana. The species is rather larger than *plumosus* Linné, averaging over 12 mm. in length, and is quite the most conspicuous species of the genus in North America. In structure it agrees very closely with *plumosus*, but may be separated by the thoracic stripes being generally ferruginous in the male, and the basal half of the dorsal surface of the abdomen yellowish (probably more greenish in life). The larva is the largest which I know

of in this genus, or in any chironomid genus, being in some cases as long as 60 mm. The absence of the ventral anal respiratory organs is peculiar and led me to suppose that the larva very probably was confined to rather shallow water. An examination of the material in the collection here proves that while as a rule this is the case, and while the larvæ are generally found in places where there is not a strong current, some specimens taken by Dr. C. C. Adams were from the river at depths of ten and a half and twelve and a half feet. From available information it is evident that the larvæ live in the mud at the bottom. This habit of embedding themselves in the mud must prove of considerable advantage to the larvæ in protecting them from enemies, as their large size and bright color make them rather conspicuous objects. The disparity between the size of the larva and that of the adult is most remarkable.

Larva.—Length, 45–60 mm. Color in life bright red; when dead, varies in color from yellowish to almost white.

The following description is of specimens preserved in alcohol.

Head pale yellow, posterior margin and ventral surface brown, margins of mouth parts brown; 2 black eye-spots on each side of head; antenna not elongated, the apical joints very much smaller than the basal joint (Pl. XIV, Fig. 18). Mandibles strongly toothed (Fig. 25); labium with the center tooth trifid (Fig. 17); palpi as in Figure 19; anterior prolegs large, their apices swollen and covered with rather soft hairs; first segments of body (thoracic) longer than second by almost one half (3–2), second and third subequal in length and both together subequal to fourth (first abdominal), fourth about two thirds as long as fifth, fifth to tenth of almost equal length, eleventh about three fourths as long as tenth, twelfth barely more than one fourth as long as eleventh, apex of twelfth segment with two small dorsal protuberances on which are situated several hairs; anal blood gills present and well developed; ventral blood gills absent; anal prolegs large, swollen, their apices with a circle of short thorns (Fig. 20).

Pupa.—Length about 20 mm. Thoracic respiratory organs with hairlike filaments; antennæ reaching beyond base of wing cases; abdominal segments flattened dorsally, without any distinct projections; apical segments shortened, distinctly broader than long.

The condition of the single specimen before me is poor and prevents a more detailed description. In most particulars it agrees closely with the pupa figured by Johannsen on Plate XVI of his paper on *Chironomidae* in Bulletin 86 (1905) of the New York State Museum.

PALPOMYIA AND SERROMYIA

The above genera may be separated from other ceratopogonine genera by the following characters: both have the wings bare, a cross vein at about the middle of the last section of first vein, connecting it with the third vein, and all, or at least one pair, of the femora with short thorns on the ventral surface. *Bezzia* and its subgenera differ from *Palpomyia* and *Serromyia* in lacking the cross vein above mentioned; *Johannseniella* differs in having no thorns on the femora; and *Heteromyia* differs in having the fore femora thickened. *Serromyia* differs from *Palpomyia* in having the hind femora very much thicker than the other pairs.

The pupa of *Palpomyia longipennis* Loew does not present any great structural differences from that figured by Johannsen as *Bezzia setulosa* Loew. The pupæ of the two species of *Johannseniella* which are in the collection here do not present any structural characters which would in any degree encourage one to accept them as of generic value, as the distinctions between one of these species and its congener are much more decided than between the former and that of *Palpomyia longipennis*. The presence or absence of the cross vein and such characters as the comparative thickening of fore or hind femora, while of value to systematists for the arrangement of species, are not infallible guides to the relationships of species. In mentioning this I may also draw attention to the fact that the presence or absence of ventral bristles on the last tarsal joint is of very doubtful value as a guide to relationships of the sexes in at least some species of this group. As an instance of this unreliability I may say that if this character were used for their separation the male of *longipennis* Loew would be relegated to *Palpomyia* in the restricted sense, while the female would fall into the subgenus *Sphæromyia*. It is thus evident that the subgenus *Sphæromyia* is an unreliable concept and must be abandoned.

The habits of the adults of *Palpomyia* are not well known; in fact but little attention has been paid to this section of the *Ceratopogoninae* as compared to that given to the blood-sucking species of the group, *Culicoides* spp. From personal observation I infer that the species of *Palpomyia* and its allies are mostly flower-frequenting in the adult stage, though I have seen a large species of *Palpomyia* feeding upon a perlid. Whether this was really a genuine case of predacity or whether the perlid had been injured prior to the attack of the *Palpomyia* I can not say, because when I first saw the insects the *Palpomyia* was in the act of sucking the juices from the thorax of the perlid, which appeared to be almost dead. This observation was made in Britain.

The revision presented herewith includes all the North American forms known to me as having been referred to *Palpomyia* and *Serromyia*.

REVISION OF SPECIES

1. Yellow species; apices of fore femora narrowly and of the hind pairs broadly blackened. Fore femora thickened; posterior tibia brownish, with a broad sub-basal ring and the apices black; last tarsal joint without spines on the ventral surface. Fore femora with black spines; tarsal claws minute, subequal. (Pa.).....*rufa* Loew.
I have not seen this species, which may really belong to the genus *Heteromyia*.
- Black or brownish black species, sometimes with very distinct pollinosity.....2
2. Wings with a distinct spot or band. Last tarsal joint unarmed. (Fla.).....*nubifera* Coquillett.
- Wings without a distinct spot.....3
3. Last tarsal joint without two rows of ventral spines.....4
- Last tarsal joint with two distinct rows of ventral spines.....9
4. Knob of halteres black; shining black species with minute subequal tarsal claws. Legs fuscous, the bases of the femora, the fore tibia, and the bases of all the tarsi yellowish. The fore femora are not thickened and have spines, while the mid and hind pairs are unarmed.....*trivialis* Loew.
Described from examples obtained at Washington, D. C. I have not seen the species, though the male which I assign to *subasper* in a subsequent part of this paper agrees very closely with the rather brief description given by Loew for *trivialis*. (See note under *subasper*, p. 223.)
- Knob of halteres yellow, or if black the species is not shining black in color; claws at least moderate in size.....5
5. Hind femora very much thickened, the fore and mid pairs normal..6
- Hind femora not conspicuously thickened.....7
6. The claws of the hind tarsi very unequal in length, the outer one at least four times as long as the inner.....*femorata* Meigen.
This common European species has been recorded by Coquillett as occurring in Alaska. I have not seen the specimens upon which the record is based, so can not say if they belong to this species.
- The claws of the hind tarsi subequal in length.
Female.—Black, shining. Antennæ, face, palpi, and legs brownish yellow. Halteres yellow. Wings grayish, veins brown.
Eyes narrowly separated; antenna reaching to base of abdomen, the joints rather distinctly haired, apical five not much elongated; proboscis very distinctly protruding, about two

thirds as long as the height of head. Mesonotum with scattered hairs on the disc. Abdomen flattened, broadened just before the middle, the apical half parallel-sided, rounded at apex, segments with short surface hairs. Legs with the surfaces very slightly hairy, the hind femur very much swollen on the apical half, and slightly bent, the concavity on the posterior side; from before the middle to the apex on both the antero-ventral and postero-ventral surfaces there are distinct, closely placed uniserial thorns; fore and mid femora unthickened and without distinct thorns; hind tibia bent, fitting into the space between the rows of thorns on the femur, and about four fifths as long as the femur; basal joint of hind tarsus subequal in length to the next three taken together; fourth joint about half as long as fifth; all tarsal claws subequal in length. Third vein three fourths of the wing-length; costa slightly hairy; fourth vein forking at cross vein. Length 2.5 mm. *crassifemorata*, n. sp.

Locality, Mt. Carmel, Ill., May 28, 1884 (H. Garman). Two females.

This species and *femorata* belong to the genus *Serromyia*.

7. Knob of halteres black; mesonotum opaque gray, with distinct, central, brown vitta.

Female.—Black-brown, opaque, the back of head, mesonotum, pleuræ, coxæ, and abdomen with thick gray pollinosity, giving to the insect a pale grayish appearance. Face brown, shining, with faint whitish pollinosity; antennæ brownish yellow, paler on the basal half; palpi yellowish. Mesonotum with a bifid brownish central vitta, and a subdorsal streak of same color on each side which does not extend much beyond middle anteriorly; when viewed from some angles there is a distinct post-humeral blackish spot which is surrounded by very distinct whitish pollinosity, this condition being reversed when the position is reversed; humeral region yellowish; scutellum colored like disc of mesonotum. Legs yellow, coxæ blackened, trochanters brown; apices of mid femora and bases of mid tibiæ slightly browned; apices of hind femora and bases of hind tibiæ distinctly and broadly browned; apices of all tibiæ and of the first three tarsal joints, as well as the whole of the last two tarsal joints, brown. Wings clear, veins very pale. Halteres yellow, knobs brown-black.

Eyes narrowly separated; antennæ with the apical five joints distinctly elongated, the entire length of antenna equal to about one and one third times the length of the head and thorax together; proboscis about half as long as height of head. Mesonotum with very numerous short, closely placed

hairs on the disc, each of which appears to have a minute brown spot at its base; scutellum with short bristles on the posterior margin, the disc with weak hairs, outline of scutellum rounded, its length equal to about one third of its breadth. Abdomen elongate, narrow. Legs long, the fore and hind femora slightly thicker than the mid pair; fore femora with about 10-12 short black thorns on the apical half of their ventral surfaces; mid and hind femora each with but one discernible bristle on the antero-ventral surface near to the apex; hind tibia straight, slightly shorter than the femur; hind tarsus slightly longer than the tibia, basal joint slightly longer than the remaining joints together; second joint barely more than a third as long as first and about two and a half times as long as third; claws elongate, subequal, toothed near the base. Wing with third vein almost seven eighths the distance to the apex; fourth vein very indistinct, the fork apparently just before the cross vein; costa almost bare. Length, 4 mm. . . . *illinoisensis*, n. sp.

Locality, Algonquin, Ill., May 25, 1894 (Nason). One specimen.

- Halteres yellow8
8. Hind tarsal claws very unequal in size.

Female.—Black, body highly polished. Legs yellow, apices of femora, of tibiae, and of first three tarsal joints, and whole of last two tarsal joints black-brown. Femora slender, the fore and mid pairs unarmed, the hind pair with two thorns on the under side near to apex. Fourth vein forking a short distance before the cross vein. Length, 3 mm. (B. C.) . . .
.....*curriei* Coquillett.

I have not seen this species. The above abridged description is from Coquillett's original definition of the species.

- Hind tarsal claws subequal in length.

Male.—Black-brown, subshining. Head brown; antennae brown, paler at the base, the hairs brown. Mesonotum very similar to that of *illinoisensis* in coloration and markings, but the pollinosity is not so dense, the vittae are not so clearly defined, and there are fewer and larger brown spots on the disc because of the sparseness of the hairs; the scutellum is generally yellowish. The abdomen is brown, slightly shining, with slight pollinosity. Legs yellow; coxae brown; all femora brown except the bases and a band at apices, the hind pair very obscurely pale at apices; tibiae either brownish at bases and apices or entirely brownish, the hind pair most distinctly browned; apices of all tarsal joints narrowly browned. Wings clear, veins brown.

Length of antenna slightly exceeding that of head and thorax together. Eyes narrowly separated; proboscis less than half as long as height of head. Mesonotum with the hairs slightly

longer and more sparse than in *illinoisensis*. Abdomen rather broad for a male, the sides subparallel, second segment elongated; hypopygium protruding as far as the combined length of the last two segments; lamellæ symmetrical. Legs long; fore femora slightly stronger than the other pairs; fore femora with 6-8, mid femora with 3-5, hind femora with 5-7 thornlike bristles, all on the apical half of the antero-ventral surface, the postero-ventral surface without distinct bristles; all legs with short hairs on the whole of their surfaces, those on the antero-dorsal surface of the hind tibia and the dorsal surface of the hind tarsus elongate; hind tibia straight; hind tarsus longer than the tibia by at least the length of the last two joints, basal joint exceeding in length the next three joints together, fourth joint half as long as fifth; claws on all legs subequal, rather stout, and of moderate length. Third vein reaching five sixths the wing-length; fourth vein forking at the cross vein; costa nearly bare. Length, 3-3.5 mm.

Female.—Differs from male in having the antennæ short-haired; the eyes are separated by a narrower line; the mesonotum is densely grayish pollinose, and the ground color, especially of the scutellum and postnotum, is distinctly paler; the abdomen is also more yellowish in color, and the pollinosity here is also more distinct; the legs are colored as in the male, but the two types of markings are very distinct, those with the brown hind tibiæ having also the anterior pairs similarly colored, the brown on the other parts of the legs more intense, and the face blackish; the legs are stronger than in the male, the thorns on the femora are not in a single row, but irregularly arranged and occupying the antero-ventral surface from middle to apex; the last tarsal joint has distinct long spines on the ventral surface; the claws are subequal, strong, and very long; the third vein extends at least nine tenths of the distance to the apex of wing (Pl. XIII, Fig. 6). Length, 4-5 mm.

This species was originally described by Loew from examples obtained from Pennsylvania, and has since been recorded from New Jersey by Smith. In the collection here, there are specimens from Algonquin and Havana, Illinois. Though the presence or absence of the spines on the ventral surface of the last tarsal joint has generally been considered as of specific value, and in some cases of generic importance, it is quite clear that the sexes here described belong to one species. In one lot of examples, reared from pupæ bearing the same data, a considerable number of both sexes occur, agreeing with the characters given, but I have failed to find in it a single male that has the two rows of ventral bristles on the

tarsi, or a female that does not have these bristles. It is probable that this character may be sexual in other species besides this one. In this revision I have placed the female in the section with the tarsal spines present.

Pupa.—Length: male, 5.5 mm.; female, 6–7 mm. Yellowish brown, slightly shining. Thoracic respiratory organ simple, rounded at base, becoming very slightly broader and distinctly flattened as it nears the apex; viewed from the ventral side the thickened part of the pupa, to the apex of the wing cases, is as long as the next four segments together; there are seven segments beyond the thickened part on the ventral side, the last segment ending in two sharp points. For details of pupa see Plate XIII, Figures 1, 2, 3, and 4. The two small sub-basal projections on the dorsal surface of the abdominal segments are represented on the ventral surface by a slight transverse raised ridge. *longipennis* Loew. Originally described from Pennsylvania.

The pupæ of this species were found by C. A. Hart floating at the surface of the water in the Illinois River at Havana. They are capable of slight movement in the water by means of the abdomen.

9. Only one spine on the fore femur, the other femora bare.

Female.—Black, the head reddish brown, first joint of antennæ and bases of the next nine, stems of the halteres, and the legs yellow; coxæ, bases of mid and hind femora, and of their tibiæ, also the last two tarsal joints, black. Mesonotum scabrous, pleuræ and abdomen polished. Fore femur with one spine on the middle of the under side; the hind femora considerably thicker than the others. Tarsal claws large, subequal. Vein 4 forked slightly before the cross vein. Length, 3 mm. (Mexico) *scabra* Coquillett.

I have not seen this species. It should be very readily distinguished from any other described form in this genus by the single bristle on the femora.

- At least the hind or mid femora with spines. 10
 10. Mesonotum without distinct pollinosity. 11
 — Mesonotum with dense pollinosity. 12
 11. Mesonotum glossy black; hind tibia entirely black; third vein from the cross vein (R_2) to its apex distinctly shorter than the section of the media bordering the posterior side of the closed cell at wing-middle, the third vein reaching about five sixths of the distance to the wing-tip.

Female.—Glossy black. Antennæ yellowish, darker at apex; face brown; pleuræ brown-black, becoming yellowish below wing base. Legs yellow; fore coxæ brown, mid and hind pairs black; apical half of the hind femur, the whole of hind tibia, and the apices of the last two tarsal joints black.

Knob of halteres black, the stalk yellow. Wings clear, veins brown.

Eyes distinctly but not very widely separated; second antennal joint very large, globose; antennal hairs pale; length of antenna distinctly exceeding that of the head and thorax together; proboscis over half as high as head, acute and highly chitinous. Mesonotum covered with very short, soft, closely placed hairs, which have a small pit at the base of each; disc of scutellum similarly haired, the margin with short bristles. Abdomen elongate, narrow at base, becoming much broader before middle, narrowing a little at apex. Legs slender, hind femora slightly bent; fore femora slightly thickened, the antero-ventral surface sometimes with as many as ten short black thorns, which are arranged distally in two rather irregular rows extending from the middle to the apex of the femur; mid femora with 3-4 thorns on the apical third of the antero-ventral surface; hind femora with 3-4 rather long slender thorns on the same surface, which are difficult to see owing to the presence of the distinct surface hairs on that part; basal joint of hind tarsus slightly longer than the remaining joints together; claws on all tarsi subequal and rather long. Venation of wing as already indicated, fourth vein forking at cross vein, the base of the lower branch very weak; costa slightly hairy. Length, 3.5-4.5 mm. *tibialis* Meigen.

This common European species has been recorded from New Jersey by Smith. It is represented in the collection here by four females from Algonquin, Ill. (Nason), and one female from Anna, Ill. (F. S. Earle).

- Mesonotum black, somewhat polished, but granulose; apices of hind tibiae black; the length of the last section of third vein distinctly exceeding the length of the section of the media bordering the lower side of the closed cell; third vein reaching about nine tenths of the distance to the wing-tip.

Female.—This species differs from *tibialis* only as follows:

The apices of fore and mid femora, the bases and apices of the tibiae of the same legs, and the apical third of hind femur and apex of the hind tibia are narrowly black; the tarsi have the apices of the first three joints narrowly and the last two joints entirely blackened. The legs are very similar in shape and armature to those of *tibialis*, but the thorns on the hind femora are more distinct. The wing venation differs as indicated. Length, 4.5-5 mm. *subasper* Coquillett.

Male.—This sex is represented in the collection here by a single example taken at the same time as the female from St. Joseph. Though this specimen differs very considerably from the female in color and size I can not consider it as distinct

specifically. In practically every respect it agrees with the description given on a previous page for *trivialis*, except that the ventral surface of the last tarsal joint has the spines present, though weak. The length of the specimen is but slightly over 2 mm., and in venation it is identical with the female of *tibialis*, while its very dark color adds to the closeness of its agreement with *tibialis*. Unfortunately the specimen is not in good condition, so it is not advisable to attempt to specify very exactly what the normal characters of the insect may be. Had Loew been describing a male instead of a female I should have had doubts as to the distinctness of *subasper* from *trivialis*.

Originally described from New Mexico.

Localities for *subasper*: Algonquin, Urbana, White Heath, Savanna, St. Joseph, and Havana, Illinois. There is also a single female in the collection here from New Orleans, Louisiana, which was taken by Prof. S. A. Forbes. This last record points to the fact that the species has a wide range, and makes it the more probable that the Illinois specimens belong to the same species which Coquillett had from New Mexico, even though they are considerably larger than the size of the type as given by him.

12. Mesonotum densely gray pollinose, without distinct brown spots or vitta; legs with the exception of the tarsi almost entirely black-brown.

Female.—Black-brown, opaque. Head brown, on the occiput and between the eyes gray pollinose; antennæ brown. Mesonotum, pleuræ, and scutellum gray pollinose, the scutellum rather yellowish. Abdomen black-brown, slightly shining, the surface whitish pollinose. Legs, including the coxæ, shining black-brown, tarsi yellow except the narrow apices of the first four joints and all of the last joint, which are black-brown. Wings slightly grayish, veins brown. Halteres yellow.

Eyes very narrowly separated; antennæ slightly exceeding the combined length of the head and thorax; proboscis over half as high as head. Mesonotum with irregular, backwardly convergent, shallow furrows, or, rather, with slightly raised ridges, on the anterior half of the disc; discal hairs short and not numerous; above the base of the wing is a group of black bristles which extends from in front of the wing-base almost to the lateral posterior callosity, upon which there is a single similar bristle; scutellum with numerous marginal bristle-like hairs. Abdomen elongated, generally slightly spatulate in form. Legs slender; fore femora with an irregular double row of thorns on the apical half of the antero-ventral surface; mid and hind femora with the thorns in a

much shorter, single row; fore and mid tibiae with a series of short setulae on the postero-dorsal surface from base to apex; hind tibia with two such rows, one on the antero-dorsal and one on the postero-dorsal surface; hind tarsus with the basal joint about two thirds as long as the tibia and distinctly longer than the remaining joints together; claws long, subequal, each with a sub-basal tooth (Pl. XIII, Fig. 5). Venation similar to that of *longipennis*, but the third vein extends but slightly more than six sevenths of the distance to the tip of the wing. Length, 5 mm. *schwarzi* Coquillett.

This species, originally described from specimens obtained from Texas, is represented in the collection here by one specimen from Algonquin (Nason), and by two specimens from Urbana, May and June, 1887, and one specimen from Champaign, July, 1887 (C. A. Hart). The last three specimens were taken at electric lights.

- Mesonotum gray pollinose, with distinct brown spots on disc. (*Longipennis* has the bristles above the wing-base very much less numerous than *schwarzi*, and confined to a space just above the anterior edge of the wing. I do not know how this character may be in *slossonæ* as I have not seen the species).....13
- 13. Apex of fore femur yellow, the central portion blackened (See No. 8) *longipennis* Loew.
- Apex of fore femur blackened.

Female.—Mesonotum gray pruinose, with a transverse row of four brown spots near the middle and another a short distance in front of the outer spots. Black, the base of antennae, stems of halteres, and the legs yellow; coxae, apices of fore and mid femora and their tibiae, the hind femora and their tibiae, also the apices of the joints of all tarsi, dark brown. Scutellum reddish brown; pleurae gray pruinose; abdomen polished. Femora rather slender, the fore pair slightly thickened and spined on nearly the entire length of their under surface; mid and hind femora with 3-4 spines on their apical halves; first joint of tarsi longer than the next three; last joint of tarsi spined below, claws large. Wings hyaline, third vein five sixths of the wing length; fourth vein forks slightly before the cross vein. Length, 4 mm. (N. H.)..... *slossonæ* Coquillett.

NOTES ON THE EARLY STAGES OF PALPOMYIA

The eggs of *Palpomyia longipennis* Loew are laid in groups on leaves of plants in the water and covered with a gelatinous substance. Those that were found were on submerged leaves, but whether the

insects enter the water to oviposit has not been observed. The larvæ are sometimes found in very large numbers in deep water in the Illinois River. When full-grown they average 15 mm. in length, and at the thickest part do not exceed 1 mm. in diameter, being very slender and slightly attenuated towards either extremity. The head is subconical and slightly more than half as long as the first thoracic segment. The antennæ are almost indistinguishable, the upper part of the mouth hangs over the front, forming a sort of flaplike covering to the orifice, and as the mouth parts are easily retracted the whole aperture may be tightly closed. The maxillary palpi are normally extended and distinct; the mandibles are long and very slender, generally very much retracted within the orifice. There are two confluent black pigmented eye-spots on each side of the head. The first three (thoracic) segments are slightly shorter than those of the abdomen, the latter being but little lengthened as they recede from the base, while the twelfth is very slender and slightly the longest. There are no distinct respiratory organs, or blood gills on the anal segment, the only appendages consisting of two pairs of hairs on either side near to the apex. In transforming to the pupa the larval skin is ruptured dorsally almost the entire length of the first two thoracic segments and the skin is cast entire. The pupæ are found floating at the surface of the water, and being capable of a slight movement are able to make their way either to the shore or to some unsubmerged object upon which they may crawl to undergo their last transformation. The pupa appears strikingly different from the entirely smooth larva, being distinctly warty abdominally, the function of the protuberances being evidently that of assisting in the progress of the pupa over the surface it may choose for its transformation. It appears from notes made by Mr. C. A. Hart, that it is essential to the emergence of the imago that the dorsal surface of the thorax of the pupa be exposed to the air, evidently to facilitate the rupturing of the skin, and when the pupa finally manages to crawl from the water it lies with the dorsal surface uppermost and the thoracic end slightly raised from the sand. The imago emerges very soon after the pupa reaches a suitable surface for transformation.

The pupæ of *Ceratopogoninae* are readily separated from those of other *Chironomidae* by the fact that the wing cases are closely adherent to the surface of the body, whereas in the other group they are always distinctly separated from the body and somewhat flaplike.

The details here given are equally applicable to *Palpomyia schwarzi*, *Johannseniella albaria*, and *J. flavidula*.

A REVISION OF THE GENUS *JOHANNSENIELLA* FOR NORTH AMERICA

This genus belongs to the subfamily *Ceratopogoninae* and is distinguished from the other genera in this subfamily by the following characters: Wings bare; a cross vein connecting the first and third veins as in *Palpomyia*; legs of moderate strength, neither the fore nor hind femora much thickened; all femora without spines on the ventral surfaces.

During the progress of my work in determining the *Chironomidae* in the collection of the Illinois State Laboratory of Natural History I have had to go to considerable trouble in getting together the scattered descriptions of species belonging to this genus, and to facilitate my work have drawn up a synoptic key which has in large measure proven useful in the work of identification. I make no claim that the key here presented is perfect, or that by means of it all the species of this genus occurring in North America may be identified, since in large part it is drawn from descriptions, and, more particularly, because there must be far more species belonging to this genus in North America than are here listed.

The Illinois species represented in the collection here are described so as to facilitate their identification where they may occur.

The habits of the species in this genus are very similar to those of *Palpomyia*, to which *Johannseniella* is very closely allied, differing from it only in the absence of the femoral thorns. The two species which have been reared from the pupal stage by members of the staff of this Laboratory are herewith figured in that stage.

SYNOPSIS OF SPECIES (FEMALES)

1. Wings with distinct spots or bands.....2
- Wings unspotted, at most the cross vein infuscated.....4
2. Wing with 3 spots.....*nebulosa* Coquillett.
- Wing with 2 spots.....3
3. Tibiæ entirely black.....*dimidiata* Adams.
- Tibiæ black at apices only.....*bimaculata* Loew.
4. Abdomen covered with silvery pollinosity; mesonotum glossy black.....*argentata* Loew.
- Pollinosity on abdomen indistinct, or if distinct then never silvery.....5
5. Cross vein of wing very heavily infuscated, the veins on other parts of the wing almost colorless.....*albaria* Coquillett.
- Cross vein not noticeably infuscated, and not more distinct than the other thick veins.....6
6. Species with the mesonotum yellow or green... ..7
- Species with the mesonotum black or black-brown.....9

7. Green species; abdomen with a transverse pair of black spots on segments 3 and 5; all tarsal claws single, with a short basal tooth *viridis* Coquillett.
- Yellow species 8
8. Tarsal claws small; last tarsal joint without ventral spines *gilva* Coquillett.
- Tarsal claws large; last tarsal joint with spines on the ventral surface *flavidula*, n. sp.
9. Last tarsal joint without any spines on the ventral surface 10
- Last tarsal joint with at least a pair of spines on the ventral surface 12
10. Fore and mid tarsi with the claws equal, the posterior pair single, with a basal tooth *polita* Coquillett.
- Claws on all tarsi subequal 11
11. Small species, 1 mm.; claws minute; vein 3 united to vein 1 on its basal fourth *arctica* Coquillett.
- Larger species, 4 mm.; claws rather large; vein 3 united to vein 1 by the normal cross vein *magna* Coquillett.
12. All tarsal claws single, with a basal tooth 13
- At least the anterior pair of tarsi with the claws subequal 14
13. Abdomen black *antennalis* Coquillett.
- Abdomen green *diversa* Coquillett.
14. Fourth vein with the lower branch obliterated except towards its apex *stigmatis* Coquillett.
- Fourth vein forking a short distance before the cross vein; both branches complete *caudelli* Coquillett.

The males of but few of the species in this genus and its allies are known, and it is not necessary to include in this table the only male I know. It will be necessary to have separate tables for determining the sexes, as the males will often, probably always, present characters differing from those of the females.

JOHANNSENIELLA BIMACULATA Loew

Ceratopogon bimaculatus Loew, Dipt. Amer. Sept. Indig. Cent. 1, 1861, sp. 6.

Female.—Glossy black, without distinct pollinosity. Head black or brown-black; scape of antenna yellow, flagellum black; face brownish yellow; proboscis and palpi yellow. Pleuræ brown-black, becoming yellow on the lower portions. (I can not see the white vitta mentioned by Loew in any of the specimens before me.) Abdomen brownish on the venter. Legs, including the coxæ, yellow; hind femora with a brown ring on apical fourth, apices of tibiae slightly browned, apices of first three tarsal joints indistinctly

browned, the last two joints blackened. Wings clear, a large fuscous spot in the middle, extending from the cross vein nearly to the apex of second vein, and another, smaller, subquadrate spot just below the apex of third vein. Halteres yellow.

Frons very wide, equal to one third the width of the head; second antennal joint very large and globose, third joint very slender, twice as long as second and subequal in length to the next two together; the entire antenna very slender and long, its length equal to two thirds the entire length of the insect, the hairs long but sparse; proboscis sharp, less than half as high as the head. Mesonotum almost entirely bare, highly glossy. Abdomen narrow at base, slightly swollen from before middle to near apex, giving it a rather club-shaped appearance. Legs slender, their surfaces with very few hairs; basal joint of fore tarsus subequal in length to the remaining four, fourth joint very short, fifth swollen and slightly longer than second, without ventral spines, claws large, subequal; inner claw on mid tarsus about half as long and strong as the outer, last tarsal joint unthickened, fourth short and bilobed; hind tarsus with the basal joint slightly longer than the remainder of tarsus, fourth joint as in mid tarsus, fifth joint not swollen, unspined below, the inner tarsal claw indistinguishable, the outer one long and strong. Third vein almost five sixths of the wing-length; fourth vein forking well in front of the cross vein.

Length, 3.5-4 mm.

Originally described from the District of Columbia by Loew. Represented in collection here by three females from Algonquin, July-August (Nason), and by one female from a cypress swamp at Pulaski, June 28, 1909 (C. A. Hart).

JOHANNSENIELLA ALBARIA Coquillett

Ceratopogon albarius Coquillett, Proc. Acad. Nat. Sci. Phil., 1895, p. 308.

Female.—Black. Head black, frons and occiput with thick, pale gray pollinosity, face brownish yellow; antennæ yellow, brownish from near base of flagellum; palpi and proboscis yellow. Mesonotum and scutellum wholly and densely gray pollinose; pleuræ brown-black, shining, slightly grayish pollinose, postnotum concolorous with pleuræ. Abdomen black, sub-shining, with two creamy white opaque bands, one before and one beyond the middle, the width of each equal to the greater part of two of the abdominal segments, the appearance being much the same as if the insect had been attacked by a fungus. Legs yellow; coxæ brownish; fore femora narrowly and mid and hind femora broadly blackened at apices; fore tibia very

narrowly blackened at base and apex; mid and hind tibiae broadly blackened at bases and very narrowly at apices; tarsal joints narrowly browned at apices, the last two all brown. Wings clear; veins yellow, the cross vein and portions of the other veins adjoining it blackened. Halteres yellow, sometimes slightly discolored on the knobs. Hairs on body pale.

Frons broad, about one fifth the head-width; second joint of antenna globose, of moderate size, third joint about equal in length to second and barely as long as the next two together; length of antenna slightly less than the combined length of head and thorax; the antennal hairs short; proboscis about half as high as head. Mesonotum with slight, irregular, backward- and outward- directed furrows on the anterior lateral margins, the whole surface with rather short pale hairs; scutellar hairs rather longer than those on the mesonotum. Abdomen apparently partly membranous on the pale portions, which causes it to contract and thus prevents one from ascertaining what the normal appearance is. Legs slender, the surfaces with distinct pale hairs; third and fourth tarsal joints of all legs short, last joint not thickened, and with distinct central spines; fore tarsi with short claws, those on the mid and hind tarsi distinctly longer and subequal in length, the inner claws slightly less robust than the outer. Third vein reaching very nearly to apex of wing; fourth vein forking well in front of the cross vein; costa almost bare.

Length, 4.5-5.5 mm.

Originally described by Coquillett from Florida.

Represented in the collection here by female specimens; one from Algonquin, June 21, 1896 (Nason); one taken at electric light, Urbana, June 18, 1887; one from Salt Fork, Urbana, July 11, 1898; and one reared from pupa found in the Illinois River at Havana June 3, 1895 (C. A. Hart, last three).

The above description does not agree in all particulars with that given by Coquillett, but it does agree with the series of examples in the National Museum collection and will serve much better to identify the species than the original brief description.

Pupa.—Length, 7 mm. Yellow, slightly shining. Thoracic respiratory organs very short, about four times as long as broad, slightly flattened on apical two-thirds; dorsum of thorax with several raised oval areas on either side of the suture (Pl. XV, Fig. 34); length from anterior extremity to apex of wing case equal to the length of the next three segments when viewed from the side; dorsal surface of segments 3 to 10 as shown in Figure 35, lateral view similar to that of segment 11, shown in Figure 36; apical segment bifid (Fig. 37).

The pupæ of this species were found under circumstances similar to those recorded for *Palpomyia longipennis* Loew (see p. 225), and no difficulty was experienced in rearing the adults from pupæ placed on damp sand.

JOHANNSENIELLA FLAVIDULA, n. sp.

Female.—Yellow, shining. Antennæ brownish yellow, scape and base of flagellum generally yellow; head brownish, face, palpi, and proboscis paler. Abdomen shining dorsad, subopaque on venter. Legs yellow, the apices of first three joints of tarsi narrowly and the last two joints entirely brown. Wings clear, veins yellow. Halteres yellow, knobs sometimes black at apex.

Frons narrow, not one eighth as wide as head; second antennal joint globose, third joint about one and a half times as long as second and distinctly longer than the next two together, length of antenna rather less than equal to that of head and thorax together, the hairs rather short; proboscis not half as long as height of head. Hairs on mesonotum extremely short, almost indistinguishable, those on the scutellum rather distinct. Abdomen somewhat spatulate, the basal segment elongated, the apical 2-3 segments short. Legs slender, surfaces slightly hairy; basal joint of all tarsi slightly shorter than the remaining joints together, third and fourth joints short, the third longer than the fourth, last joint longer than the second, the ventral spines distinct; all tarsal claws subequal in length and rather large, each with sub-basal tooth. Third vein about four fifths the length of the wing; fourth vein forking before the cross vein; costa with microscopic hairs.

Length, 4.5-5.5 mm.

Type locality, Havana, Illinois; reared from pupa found in the Illinois River May 3, 1895 (C. A. Hart).

Paratypes: Havana, same date as type, seven females; Havana, May 25, 1895, Illinois River (C. A. Hart), one female; and two females, Algonquin, one dated May 14, 1894 (Nason).

Pupa.—Length, 7 mm. Yellow, subopaque, the surface slightly granulose. Thoracic callosities much smaller than in *albaria* (see Pl. XIV, Fig. 30), the respiratory organs rather larger, but distinctly smaller than in *Palpomyia longipennis*. Length from anterior margin to apex of wing case equal to that of the next three and a half segments; dorsal and lateral projections on the abdominal segments leaflike and very distinctly protuberant (Fig. 31); apical segment bifid (Figs. 32 and 33).

Amongst the material in the collection here, there are a number of males reared from pupæ found in the Illinois River at the same time and place as those which produced the females above described. Though these specimens differ to a considerable extent from the females, I consider them as undoubtedly belonging to the same species, and describe the sex herewith.

Male.—Shining reddish-brown. Head glossy reddish-brown; antennæ, palpi, and proboscis brown; antennal hairs yellowish. Mesonotum glossy brown, sometimes yellowish just in front of the scutellum; scutellum generally yellow, but at times as dark as mesonotum; pleuræ slightly paler than the disc of mesonotum; postnotum concolorous with pleuræ. Abdomen brown, shining. Legs yellow; apices of hind femora rather broadly browned, apices of tibiæ and of the first three tarsal joints slightly browned, last two tarsal joints entirely brown. Wings clear, veins yellow. Halteres yellow, the knob sometimes brownish at apex.

Antennæ thicker than in female, second joint much larger, the basal half of the flagellum with the joints shorter and thicker than in female, the surface hairs very long, length of antenna about equal to that of head and thorax together; structure of head very similar to that of female. Discal hairs on mesonotum short, but considerably longer than in the female, scutellar hairs distinct, but short. Hypopygium large, protrusion equal to the combined length of the last three abdominal segments. Legs slender, rather distinctly haired, especially on the dorsal surfaces of the hind tibiæ and tarsi; last tarsal joint without ventral spines; tarsal claws subequal, much smaller than in the female, without distinguishable tooth. Venation as in female.

Length, 3-3.75 mm.

Locality, same as for the type. A series of seventeen specimens.

If taken in general collecting and at a different time and place from the female one might be pardoned for describing the male as a different species; but though the differences between the sexes are very considerable I have found their parallel in *Palpomyia*, and consider that they really belong together.

The male of this species has much the same coloration as has the female of *caudelli*, but the male of *caudelli* will presumably be much smaller than that above described and also darker in coloration.

JOHANNSENIELLA CAUDELLI Coquillett

Ceratopogon caudelli Coquillett, Journ. N. Y. Ent. Soc., Vol. 13, 1906, p. 63.

Female.—Black, highly glossy. Head black, antennæ, face, palpi, and proboscis black-brown. Legs yellow, with varying extent of

brown on coxæ, apices of femora, bases of hind tibiæ, apices of all tibiæ, apices of first three tarsal joints, and the whole of last two tarsal joints. Wings clear, veins brownish. Halteres yellow, or slightly browned, or apically blackened.

Frons broad at vertex, equal to about one fifth of the width of head, becoming almost linear at the anterior margin; second joint of antenna globose, third joint slightly longer than second and as long as the next two together, hairs very short, length of antenna not equal to that of head and thorax together. Mesonotum with very short, soft discal hairs; scutellar hairs more distinct on margin. Abdomen narrowed at base and apex, club-shaped. Legs slender; basal tarsal joint as long as the next three; joints 3 and 4 short, 5 longer than 2, spinose ventrally; tarsal claws large, subequal, each with a sub-basal tooth. Wings with third vein extending more than three fourths of the distance to apex; fourth vein forks before the cross vein; costa with very weak short hairs.

Length, 2.75-3.5 mm.

Originally described from British Columbia.

Represented in the collection here by examples from Algonquin—eight specimens, all taken in May of various years (Nason)—and Havana, on the Illinois River—one specimen, also taken in May (C. A. Hart).

The male is undescribed.

I have not seen Coquillett's type specimen, but the examples before me agree in all essential particulars with the description of *caudelli* given by him.

To make the foregoing revision of the genus *Johannseniella* as complete as possible it may be added that *magnipennis* Johannsen agrees with the description of *albaria* Coquillett, the latter of which Johannsen did not include in his list of species belonging to this genus when he described *magnipennis*. Johannsen's species *flaviceps* I am unable to include in my table as I do not wish to assume the presence of characters not mentioned in the description. Provided, however, that it really belongs to this genus it should fall, in my key, in the same section as *arctica* and *magna*, from both of which it differs in size, being 2 mm. in length, and in the color of legs and halteres, the latter being black. I may indicate that the color description, and in fact all the essential characters given by Johannsen except the absence of femoral thorns, agree with those of *Palpomyia trivialis* Loew.

The European species *lacteipennis* Zetterstedt has been recorded from Greenland by Lundbeck. I have not seen the species, but it may be known from *arctica* by the different color and venation of the

wings. In *lacteipennis* the wings are milky white, the third vein is connected with the first by means of the usual cross vein, and the lower branch of the fourth vein is indistinct at its base. Both species are 1 mm. in length and black in color, though the mesonotum in *lacteipennis* is subopaque, while in *arctica* it is polished.

MYCETOPHILIDÆ

ZYGONEURA FENESTRATA, n. sp.

Male.—Black. Frons shining; antennæ black, scape yellow. Mesonotum shining, the hairs on the surface pale; pleuræ brown, the sutures paler; scutellum concolorous with the mesonotum. Abdomen brown, subopaque. Legs brown or blackish, coxæ and bases of femora yellowish. Halteres yellow, knob brownish black. Wings clear, the surface hairs giving them the appearance of being grayish; veins brown.

Ocellar region slightly raised; antennæ with the second joint swollen, the joints of the flagellum long-stalked, the whorls of hairs long and distinct; palpi elongate, the joints subequal, slightly hairy. Mesonotum with two slight longitudinal depressions, which extend beyond middle and are slightly convergent posteriorly, bearing rows of rather long pale hairs; the whole disc pollinose except a narrow anterior central stripe and the margins of the depressions, which, when viewed from in front, gives the mesonotum the appearance of being trivittate; the pollinosity most distinct in front of the scutellum; margins of the mesonotum laterally with distinct hairs; disc of scutellum and the posterior margins with long hairs. Abdomen with numerous soft surface hairs, segments subequal; hypopygium large and protruding, much as in *Sciara* (Pl. XIV, Fig. 27). Legs slender; basal joint of hind tarsus about two thirds as long as the tibia and two and a half times as long as the second joint; tibial spurs absent; claws very small. Wing as in Figure 26.

Length, 2–3 mm.

Female.—Similar to male except in the structure of the antenna, which in the male is at least as long as the entire insect and 2–14 jointed; whereas in the female, besides being shaped as in Figure 24, the entire length of the antenna does not exceed one half that of the insect, and consists of only 2–10 joints, the last joint being very short. Genitalia as in Figure 23.

Length, 2.5–3.5 mm.

Locality, Urbana, Illinois; a large series taken on the windows of the Natural History Building of the University of Illinois during November, 1913 (C. A. Hart and J. R. Malloch).

This species does not agree in venation with the previously described species of *Zygoneura*, but the pedicellate antennal joints of the male with their whorls of hairs are characteristic of that genus.

ZYGOMYIA INTERRUPTA, n. sp.

Male.—Black, shining. Face yellowish brown; base of antennæ, including the first 2–3 joints of the flagellum, yellowish; palpi yellow. Thorax black, only the region of the anterior spiracle yellowish. Abdomen black, the hypopygium yellowish. Legs, including the coxæ, yellow, apices of mid and hind coxæ slightly blackened; fore and mid femora slightly darkened at apices, hind femora blackened on almost the entire apical third; tarsi slightly browned. Wings with a noticeable spot over the cross vein, and very faint indications of a grayish preapical cloud on the region of the wing occupied in *ornata* by the dark spot. Halteres pale yellow. Surface hairs on body brownish yellow, the bristles black.

Basal and third antennal joints subequal; basal and second joints with apical setulæ. The upcurved prothoracic bristle on each side very strong; scutellum shorter than in *ornata*, its breadth about equal to twice its length; four scutellar bristles present. Hypopygium with two small, rounded, slightly projecting lobes, covered with short hairs, the whole organ very inconspicuous. Legs bristled as in *ornata*, the hind tibia with two rows of strong bristles, the postero-dorsal surface with a series of short setulæ; mid tibia with two ventral spines. Wing as in Plate XIV, Figure 29, the lower branch of the media not reaching the margin of the wing.

Length, 2.5 mm.

Locality, Urbana, Illinois, November 13, 1913, on window of basement of Natural History Building, University of Illinois (J. R. Malloch).

This species may be separated from any other described species in this genus by the incomplete lower branch of the media. This character occurs in some of the species in the genus *Cordyla*, but the structure of the antennæ is quite different in the two genera.

BIBIONIDÆ

FORBESOMYIA, n. gen.

This genus is distinguished by the following characters: Ocelli present, forming an equilateral triangle; eyes large, covering the entire side of head; frons wide, converging above antennæ; antennæ short,

consisting of 2+7 joints (see Pl. XIV, Fig. 21); palpi and proboscis not discernible in type specimen. Thorax short and broad, without a distinct suture except at the anterior angles, where the prescutum shows distinctly; scutellum large and distinct. Abdomen slightly flattened, with seven distinct segments, the incisions between the segments very distinct (Fig. 28). Legs short and thick, the basal joint of tarsus longer than the second; tarsus subequal in length to the tibia, the claws very small; tibiae as long as the slightly thickened femora, the apical spur absent. Wing venation as in Figure 22.

Type of genus, *Forbesomyia atra*, n. sp.

FORBESOMYIA ATRA, n. sp.

Female.—Entirely black, opaque. The venter of the abdomen slightly brownish. Wing veins vitreous with the exception of the thick veins, which are brown.

Head without distinct hairs except a very few short ones on the face; antenna slightly shorter than the height of the head, with microscopic pilosity. Mesonotum, pleuræ, and scutellum without any distinct hairs or bristles, only microscopic pile present on the mesonotum. Abdomen about three times as long as head and thorax together, shaped as in Figure 28, Plate XIV; the surface with very short, soft, decumbent hairs. Legs with very short surface hairs, appearing bare except under a strong lens; the anterior surfaces of the coxæ with rather longer pale hairs. Wings bare, the costa unfringed, the posterior margin with distinct, though not long, fringe.

Length, 2.25 mm.

Locality, Urbana, Illinois, November 7, 1913 (C. A. Hart and J. R. Malloch).

This genus is very difficult to locate properly in any of the families, but finds its closest affinities with the *Bibionidæ*. The presence of ocelli, the short antennæ, and the strong legs point to an association with *Scatopse*, to which the wing venation also bears some resemblance. The absence of the cross vein is however peculiar to *Forbesomyia*. In the chironomid genus *Tersesthes* Townsend, we have an approach to the same neurulation, but there are radical differences even here, and the antenna of *Tersesthes* is quite different in its structure.

The single specimen upon which the genus and species are founded was taken on a window of the basement of the Natural History Building of the University of Illinois. Nothing is known therefore of the early stages of the species, though it may be pointed out that at the same time and place specimens occurred that were referable to

Scatopse, *Zygoneura*, *Zygomyia*, *Leptocera*, *Lestremia*, and various *Cecidomyiidae*.

The genus is named in honor of Prof. S. A. Forbes, State Entomologist of Illinois.

DOLICHOPODIDÆ

CHRYSOTUS Meigen

The species belonging to this genus are usually brilliant metallic green in color and of very small size, averaging about 2 mm. in length. Little is known of their habits in the early stages. The adults may be met with almost anywhere, during the summer months, running on leaves of plants in the sunshine. They are, as far as I have observed, purely flower- and plant-frequenting species, feeding on nectar, honeydew on leaves, and on moisture. Some of the species are met with near water, but often they occur at considerable distances from any body of water.

The species of *Diaphorus* are very closely allied to those of *Chrysotus*, and in some cases it is merely a question of individual opinion to which genus a species belongs. It may be accepted as a guide to the classification of the species of these genera that in *Chrysotus* the legs are less elongated and the pulvilli not enlarged on the fore tarsi. This is practically a summary of the differences that exist between the genera, *Diaphorus* having the legs elongated and the pulvilli of the fore tarsi at least, much enlarged. The males of *Diaphorus* have also a group of four or more bristles on the apex of the hypopygium, but these are sometimes weakly represented in species which obviously belong to *Chrysotus*. The two genera are very closely allied, and any revision of one of them would be necessarily incomplete unless the other were treated jointly with it.

CHRYSOTUS CILIATUS, n. sp.

Male.—Metallic green. Frons with a slight violet-blue tinge; face green, with a slight whitish pollinosity; palpi yellowish, proboscis black; postocular cilia white; antennæ black, arista concolorous. Mesonotum on the posterior half with a slight violaceous tinge, the anterior and lateral margins with slight white pollinosity; pleuræ with slight violaceous tinge but not glossy; scutellum bright green. Abdomen with distinct cupreous tinge on the dorsum. Legs yellow, coxæ except the apices, all the femora except the extreme bases and apices, the entire hind tibiæ and their tarsi, and the apices of the other tarsi

blackened, the femora and hind tibiae with a metallic green tinge. Tegulae and their cilia yellowish. Halteres yellow. Wings clear, veins brown-black. All bristles black.

Frons slightly narrowed anteriorly; face as in Figure 14, Plate XIII; antennae large, shaped as in Figure 12, the third joint very distinctly pilose; palpi small, scarcely protruding. Mesonotum with two rows of acrostichals; scutellum slightly transverse posteriorly, the lateral posterior corners not regularly rounded, basal bristles hairlike. Abdomen normal, the surface hairs rather strong. Legs stout; fore tibia with one setula on antero-dorsal surface at about basal third, and on the postero-dorsal surface two weak setulae, one at the basal fifth and the other near the middle; mid tibia with two strong bristles on the antero-dorsal surface, one just before the basal third and the other just before the apical third, the postero-dorsal surface with two weaker bristles at about the same distance from base and apex as the other two; hind femora with the antero-ventral bristles confined to the apical third; hind tibia distinctly but not greatly thickened, the postero-ventral surface with four strong bristles which are almost equally spaced, the first about one fifth from the base, and the last very near to the apex, the antero-dorsal surface with two strong bristles, the first near the basal fourth, and the other just below the middle; the anterior surface with a ciliation of short hairs on its entire length; all tarsi slightly thickened, the posterior pair equal in length to their tibiae, their surfaces hairy, but not conspicuously so. Cross vein before middle of wing; costa normal.

Length, 2.5 mm.

Locality, Champaign, Illinois (Marten and Hart). Taken at the same time and place as *flavisetus*.

This species belongs to the group which includes *obliquus* Loew and *affinis* Loew. *Ciliatus* differs from both of these in the broader face, and from *affinis* in the shape of the third antennal joint. Wheeler's species *choricus* also belongs here. The color of the tegular cilia in this group is not reliable as a guide to the separation of the species, as in many cases it varies very considerably according to the angle from which it is viewed. The large white palpi of *choricus* should prove the most reliable character for its separation from *affinis*, to which it is very closely allied. The species herewith described has evidently much stronger bristling on the hind tibia than either *affinis* or *obliquus*.

Both sexes of *choricus*, taken at the same time and place as *ciliatus*, are in the collection of the Illinois State Laboratory of Natural History.

CHRYBOTUS SPINIFER, n. sp.

Male.—Metallic green. Frons dark metallic green, slightly gray pollinose; face green, paler than frons and with denser pollinosity, which is yellowish and distinctly lustrous; antennæ black-brown, arista concolorous; palpi white, with a distinct luster; proboscis black; postocular cilia silvery white. Mesonotum with the green color somewhat obscured by brownish pollinosity, but shining; scutellum concolorous with disc of mesonotum. Tegulæ and their fringe yellow. Abdomen green, fourth and fifth segments cupreous on the dorsum; surface hairs brown. Legs metallic green, the knees yellowish, tarsi brown; in some lights the tibiae brown on ventral surfaces. Wings clear, veins black. Bristles black.

Frons about one third the head-width, the face very little narrower, the latter slightly narrowest at center; antennæ of moderate length, third joint reniform (Pl. XIII, Fig. 9); palpi large and leaf-like (Fig. 8), at the broadest part as wide as face; postocular cilia very long and beardlike. Bristles on mesonotum strong, acrostichals indistinguishable; basal pair of scutellar bristles very weak and hair-like. Abdomen with rather strong surface hairs; ventral organs of the hypopygium small. Legs slender; fore tarsus slightly longer than tibia; mid pair about equal in length to their tibia; hind tarsus barely two thirds the length of the tibia; mid tibia with one strong bristle at about the basal third on the anterior surface, and three setulæ almost on the dorsal surface, the one farthest from base, and largest, being just about the middle; antero-dorsal surface of hind tibia with one bristle at basal third and another at middle, the antero-ventral surface with a series of 4-5 setulæ from before middle to apex, increasing a little in length as they near apex, the postero-dorsal surface with a series of 5-6 bristles the whole length of the tibia; basal joint of hind tarsus as in Figure 10, Plate XIII, with a strong ventral bristle; surfaces of all legs with short hairs. Cross vein at wing-middle; veins 3-4 slightly convergent.

Length, 2.75 mm.

Locality, Algonquin, Illinois (Nason). One male.

Diaphorus simplex Ald. has a ventral spine on the hind metatarsus, but the venation, palpi, etc., are quite different. The species described herewith is difficult to place in either *Diaphorus* or *Chrysotus*, but I consider it has closest affinities with the latter.

CHRYBOTUS ANOMALUS, n. sp.

Male.—Frons black, with a slight greenish luster; basal joint of antennæ pale yellow, the other two joints black; face brownish, with

slight, pale pollinosity; palpi and proboscis brown; postocular cilia whitish. Mesonotum metallic blue-black, becoming cupreous on the posterior half, without distinct pollinosity; scutellum more greenish; pleuræ black, slightly shining and without metallic luster. Abdomen black-brown, shining, with a bluish luster on dorsum; ventral appendages of hypopygium yellow. Legs yellow, mid and hind coxæ blackened at bases, tarsi brownish towards the apices. Tegulæ yellowish, fringe concolorous. Wings clear, the anterior half slightly grayish, veins brown. All bristles black.

Frons distinctly over one third the width of the head, becoming narrower anteriorly; face linear, distinct only below antennæ, in the form of a small triangle; palpi and proboscis very small; head distinctly higher than long, the antennæ inserted slightly above the middle; eyes slightly pubescent, the facets distinctly enlarged below level of antennæ on an area bordering the face; third antennal joint elongated, acutely pointed, and very distinctly pilose (Pl. XIII, Fig. 11); arista in type very short, possibly broken. Legs slender, slightly hairy, the hairs especially noticeable the whole length of the antero-dorsal surface of the hind tibiæ and on the same surface of the basal joint of the hind tarsus; the mid femora have a row of distinct bristles the whole length of the postero-ventral surface; mid tibia with a rather distinct bristle at basal third on the antero-dorsal surface; hind femora much less strongly bristled than the mid pair, the hair-like bristles confined to the antero-ventral surface. Wings with cross vein at middle; veins 3-4 slightly divergent; costa very short-haired, unthickened.

Length, 1.5 mm.

Locality, New Orleans, Louisiana (S. A. Forbes).

This species resembles *acutus* Aldrich in the shape of the third antennal joint, but differs in several essential characters from the description of that species as given by Aldrich.

CHRYBOTUS FLAVISETUS, n. sp.

Male.—Metallic green. Frons dark metallic green, anteriorly white pollinose; face thickly covered with silvery pollinosity which almost obscures the green ground-color; antennæ black-brown, arista concolorous; palpi white; proboscis brownish; postocular cilia whitish. Mesonotum emerald green, with distinct whitish pollinosity; scutellum with a bluish tinge; pleuræ black, posteriorly opaque, anteriorly with a metallic, bluish luster. Abdomen rather darker than the mesonotum, the dorsum with a cupreous tinge; the slightly projecting ventral appendages of the hypopygium yellow. Tegulæ, tegular fringe, and

halteres yellow. Legs, including coxæ, yellow, the mid and hind coxæ slightly reddish at bases. Wings clear, veins brown. Bristles on mesonotum and scutellum, as well as the hairs on the abdomen, when viewed from above and in front, yellow.

Frons about one third the width of the head, the eyes slightly concave a little above antennæ, which causes the frons to have its widest expanse at that point; face wide, equal to about one fourth the head-width at center, becoming very slightly wider at lower extremity, and very distinctly wider at upper extremity; antennæ situated slightly above middle of profile, shaped as in Figure 15, Plate XIII, the pubescence on the third joint very distinct; palpi rather broad, about equal in breadth to the width of the face at mouth-margin; postocular cilia distinct, but not beardlike. Mesonotum with two rows of acrostichals; scutellum rounded in outline, the basal pair of bristles weak. The hairs on hind margins of abdominal segments rather long; several weak hairs on apex of hypopygium. Legs slender; (fore tibiæ and tarsi missing in type specimen;) mid tibia with one distinct bristle on the antero-dorsal surface at about the basal fourth; hind tibia with one bristle at basal fourth on antero-dorsal surface, and 4-5 rather stronger ones lengthwise of the postero-dorsal surface; tarsi normal; all legs with short surface hairs. Cross vein at wing middle; veins 3-4 slightly divergent.

Length, 2 mm.

Female.—Similar in coloration to the male. Differs considerably in the structure of the head. The face, below the antennæ, is nearly one third the width of head at same part, converging towards lower extremity, where it is slightly over one half as wide as at upper extremity; the antennæ are much smaller (Pl. XIII, Fig. 16) and the arista is rather longer; the palpi are slightly more enlarged, and the proboscis is more protruding. The legs are colored and bristled as in the male. There is one very weak setula on fore tibia at about the basal fourth.

Locality, Champaign, Illinois, taken alongside of railroad June 22, 1888 (Marten and Hart). One male and eight females.

ANTHOMYIDÆ

FANNIA LATIFRONS, n. sp.

Male.—Black. Frontal stripe and orbits silvery white; facial orbits and face with similar pilosity; antennæ black, palpi and proboscis concolorous. Mesonotum shining black, with faint brownish pollinosity; scutellum and pleuræ concolorous. Abdomen shining

black, but when viewed from behind the sparse whitish pollinosity obscures the surface of each segment so as to leave a narrow dorso-central stripe and a narrow post-marginal fascia; hypopygium black, the surface grayish pollinose. Legs black, fore tibia and all the tarsi yellowish. Wings clear. Calyptræ white, the fringe concolorous. Halteres yellow.

Frontal stripe very wide, at vertex one fourth the width of the head, becoming slightly wider near to base of antennæ; orbits wide, each at middle equal to width of central stripe; one distinct orbital bristle present; inner margin of orbits with a single row of rather strong cruciate setulæ, otherwise bare; antennæ reaching to epistome, third joint broader than usual in this genus; arista bare; palpi normal. Mesonotum with two presutural macrochætæ; the acrostichals in three rows. Abdomen not longer than thorax; hypopygium distinct, though not conspicuous. Fore tibia with only the preapical bristle; mid and hind femora slightly thickened, the former very little constricted at apex; antero-ventral surface of mid femur with rather short bristles, which are somewhat widely spaced to middle (4-5), then become closer, and on the apical third become very short and comblike; postero-ventral row rather longer; mid tibia becoming slightly thicker from base to apex, the pubescence on the ventral surface very short and inconspicuous; the usual bristles present on the apical third, but very weak; hind femur with a row of very weak, short, hairlike bristles on the antero-ventral surface, only the last two strong, the postero-ventral surface without any distinct bristles; hind tibia with two dorsal, one antero-dorsal, and one antero-ventral bristles; no distinguishable setulæ above the antero-dorsal bristle; tarsi normal. Outer cross vein of wing at about its own length from end of fifth vein; last section of fourth vein about two and one half times as long as the penultimate section. Under scale of calyptræ distinctly larger than the upper.

Length, 2.5 mm.

Locality, Elliott, Illinois, July 10, 1906 (E. O. G. Kelly).

This species is readily separated from any previously described form in this genus by the very widely separated eyes. In general appearance *latifrons* resembles *Steinomyia steini* Malloch, but the lower orbital bristle of the male of the former is not present in *latifrons*.

In the same collection there is a female in rather poor condition that very probably belongs to this species. It differs from the male in having the frons with white pollinosity, which is not silky, or metallic in luster; in having the normal 2 orbital bristles; only 3

pairs of cruciate bristles; the entire frons at vertex one third as wide as head; the antennæ slightly shorter; and the legs with the same form and bristles as in the female of *serena*. In other respects the specimen agrees so closely with the male that I consider it as almost certainly belonging to the same species.

ADDENDUM

After this paper went to press Mr. C. A. Hart and the writer succeeded in obtaining, at Muncie, Ill., a large series of *Palpomyia trivialis* Loew, representing both sexes. This species may be separated from *P. subasper* Coquillett by the bristling of the femora, the thorns being confined to the fore pair, and, in the female, by the absence of the spines on the ventral surface of the last tarsal joint. The male is very similar to that of *subasper* and may readily be confused with it, as the thorns on the mid and hind femora are weak; but the claws are distinctly smaller in *trivialis*, and there are no traces whatever of thorns except on the fore femora. The last section of the costa in both sexes of *trivialis* is almost equal in length to the distance from its apex to the apex of the upper branch of the media.

EXPLANATION OF PLATES

PLATE XIII

- FIG. 1. Pupa of *Palpomyia longipennis*, apical three segments, lateral view.
 FIG. 2. Thoracic respiratory organ of same.
 FIG. 3. Fourth abdominal segment of same, dorsal view.
 FIG. 4. Apical segment of same, dorsal view.
 FIG. 5. *Palpomyia schwarzi*, last tarsal joint of female.
 FIG. 6. *Palpomyia longipennis*, wing of female.
 FIG. 7. *Chironomus compes*, femur, tibia, and first two tarsal joints of hind leg.
 FIG. 8. *Chrysotus spinifer*, palpus of male.
 FIG. 9. Antenna of male of same.
 FIG. 10. Basal joint of hind tarsus of same.
 FIG. 11. *Chrysotus anomalus*, antenna of male.
 FIG. 12. *Chrysotus ciliatus*, antenna of male.
 FIG. 13. *Chrysotus choricus*, antenna of male.
 FIG. 14. *Chrysotus ciliatus*, head of male from in front.
 FIG. 15. *Chrysotus flavisetus*, antenna of male.
 FIG. 16. Antenna of female of same.

PLATE XIV

- FIG. 17. *Chironomus ferrugineovittatus*, labium of larva.
 FIG. 18. Antenna of larva of same.
 FIG. 19. Maxilla of same.
 FIG. 20. Anal segments of same.
 FIG. 21. *Forbesomyia atra*, antenna of female.
 FIG. 22. Wing of female of same.
 FIG. 23. *Zygocura fenestrata*, apex of abdomen of female.
 FIG. 24. Antenna of female of same.
 FIG. 25. *Chironomus ferrugineovittatus*, mandible of larva.
 FIG. 26. *Zygoneura fenestrata*, wing of male.
 FIG. 27. Hypopygium of male of same, lateral view.
 FIG. 28. *Forbesomyia atra*, abdomen of female, dorsal view.
 FIG. 29. *Zygomyia interrupta*, wing of male.

PLATE XV

- FIG. 30. *Johannseniella flavidula*, thorax of pupa, dorsal view, showing the split made by the emergence of the imago.
 FIG. 31. Dorsal view of third segment of abdomen of pupa of same.
 FIG. 32. Lateral view of last three abdominal segments of same.
 FIG. 33. Dorsal view of apical segment of abdomen of same.
 FIG. 34. *Johannseniella albaria*, thorax of pupa, showing the condition before emergence of adult.
 FIG. 35. Dorsal view of third abdominal segment of pupa of same.
 FIG. 36. Lateral view of last three segments of abdomen of same.
 FIG. 37. Dorsal view of apical segment of abdomen of same.

PLATE XIII

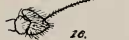
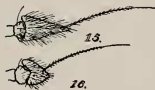
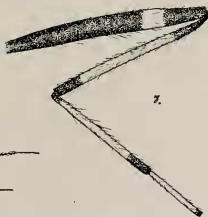
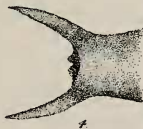


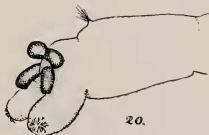
PLATE XIV



17.



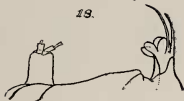
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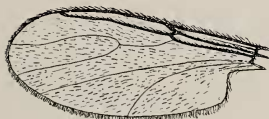
23.



24.



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27.



28.



29.

PLATE XV



30.



34



35.



37.



32.



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36.



37.

J.R. Mallon del. &c.